REMARKS

This Amendment is responsive to the Office Action mailed April 25, 2008. With this Amendment, claims 1-4, 10, and 14-17 are amended, claims 5-8 are cancelled, and claims 19-21 are added. Claims 1-4 and 9-21 are pending.

Amendment to the specification is made to provide a more literal translation of the original Japanese. Accordingly, support for the amendment to the specification can be found, for example, in the original Japanese language application PCT/JP2004/013068 at page 1, paragraphs [0002] and [0004]; paragraph [0019] bridging pages 6-7; page 7, paragraph [0020]; and page 8, paragraph [0024].

Support for the other amendments can be found throughout the specification and claims as filed, e.g. page 6, lines 9-11; page 8, line 30 through page 9, line 8; page 11, lines 1-20; and page 12, lines 4-14 and 27-28.

Priority

Applicants thank the Examiner for acknowledging the claim for foreign priority, as well as receipt of all certified copies of the priority documents.

Information Disclosure Statement

Applicants also thank the Examiner for considering all of the documents listed in the Information Disclosure Statement submitted June 14, 2006.

Claim Rejections - 35 U.S.C. § 102(b)

The Office Action rejects claims 1, 3, 5, and 10 under 35 U.S.C. 102(b) as allegedly anticipated by Kikuchi (U.S. Patent No. 5,753,353; hereinafter KIKUCHI). In particular, the Office Action alleges that KIKUCHI teaches a manufacturing method for an SOI wafer comprising the steps of: 1) bonding a wafer for active layer with a supporting wafer via an insulting film interposed therebetween to thereby form a bonded wafer; and 2) reducing a film thickness in a part of said active layer wafer or said bonded wafer to thereby form an SOI layer for manufacturing said SOI wafer, wherein said supporting wafer that has been bonded contains boron by an amount of 9×10^{18} atoms/cm^3 or more. In addition, the Office Action alleges that KIKUCHI teaches an SOI layer having a thickness of 0.1 μm or thinner and that KIKUCHI also teaches an insulting film formed at least on a surface opposite to a bonding surface of said supporting wafer before said step of bonding.

In response, Applicants submit that the disclosed and claimed subject matter is not anticipated by KIKUCHI. KIKUCHI teaches an SOI substrate comprising a silicon supporting substrate, an insulting film formed on the top of the silicon supporting substrate and a silicon active layer formed on the insulating film. With regard to Figure 3C, KIKUCHI further teaches that the silicon substrate is polished to form a silicon active layer having a thickness of about 2 micrometers. With regard to Figure 6C, KIKUCHI teaches a silicon substrate which is polished to form a silicon active layer having a thickness of about 0.1 micrometers. In contrast, Applicants submit that KIKUCHI does not disclose "[a] manufacturing method of an SOI wafer, comprising:

bonding a wafer for active layer with a supporting wafer via an insulating film interposed

therebetween to thereby form a bonded wafer; and then

reducing a film thickness in a part of said active layer wafer of said bonded wafer to thereby form an SOI layer for manufacturing said SOI wafer, wherein said supporting wafer contains boron by an amount of $9x10^{18}$ atoms/cm^3 or more; and

forming a rear surface insulating film on a surface opposite to the bonding surface of the supporting wafer prior to said bonding." Neither does KIKUCHI disclose such a method wherein a thickness of said SOI layer is less than 0.10 μm. Nor does KIKUCHI disclose "[a]n SOI wafer comprising:

a wafer for active layer bonded with a supporting wafer via an insulating film interposed therebetween, wherein

said wafer for active layer has a thickness of less than 0.10 μm;

said supporting wafer comprises boron by an amount of $9x10^{18}$ atoms/cm^3 or more; and

a rear surface oxide film having a thickness of 0.1 μm to 0.5 μm is formed on a surface opposite to the bonding surface of said supporting wafer."

Applicants further submit that the specification of the instant application discloses that the insulating film formed at the back surface of the supporting wafer before bonding serves as a gettering site for the boron (page 12, 1st full paragraph). In particular, this prevents outward diffusion and wrap around of boron from the supporting wafer and further leads to the prevention of contamination due to metal impurities of the SOI layer. Moreover, the rear surface oxide film prevents wafer warp in the direction of BOX (embedded oxide film), which can occur when the SOI layer is thin.

Applicants also submit that provision of the SOI layer with a thickness of less than 0.1 μm allows high precision LPD evaluation.

Based at least on the above, Applicants submit that the disclosed and claimed subject matter is not anticipated by KIKUCHI. Accordingly, Applicants respectfully request withdrawal of the rejections under 35 U.S.C. § 102(b).

Claim Rejections – 35 U.S.C. § 103(a)

The Office Action also rejects claims 2, 4, and 6-8 under 35 U.S.C. § 103(a) as allegedly unpatentable over KIKUCHI in view of Sakaguchi et al. (U.S. Patent No. 6,613,678; hereinafter SAKAGUCHI). In particular, the Examiner asserts that KIKUCHI fails to disclose the steps of:

ion-implanting of hydrogen gas or a noble gas element to said active layer wafer to thereby form an ion-implanted layer in said active layer wafer;

subsequently bonding said active layer wafer and said supporting wafer together to thereby form a bonded wafer; and

heat treating said bonded wafer to thereby induce cleavage in said bonded wafer at the site of said ion-implanted layer as an interface.

For these missing features, the Office Action relies upon SAKAGUCHI and points to Figures 2-6 and column 6, line 5 through column 7, line 25 for support. In addition, the Office Action asserts that it would have been obvious to combine the KIKUCHI and SAKAGUCHI documents for the benefit of establishing a manufacturing process for SOI substrate that is free of oxidation induced stacking faults as taught by SAKAGUCHI.

In response, Applicants submit that the disclosed and claimed invention is not unpatentable over KIKUCHI and/or SAKAGUCHI, either alone or in combination. In particular, Applicants submit that neither KIKUCHI nor SAKAGUCHI disclose or fairly suggest "[a] manufacturing method of an SOI wafer, comprising

bonding a wafer for active layer with a supporting wafer via an insulating film interposed therebetween to thereby form a bonded wafer; and then

reducing a film thickness in a part of said active layer wafer of said bonded wafer to thereby form an SOI layer for manufacturing said SOI wafer, wherein said supporting wafer contains boron by an amount of $9x10^{18}$ atoms/cm^3 or more; and

forming a rear surface insulating film on a surface opposite to the bonding surface of the supporting wafer prior to said bonding." Neither do the cited documents disclose or fairly suggest such a method further comprising:

ion-implanting of hydrogen gas or a noble gas element to said active layer wafer to thereby form an ion-implanted layer in said active layer wafer;

subsequently bonding said active layer wafer and said supporting wafer together to thereby form a bonded wafer; and then

heat treating said bonded wafer to thereby induce cleavage in said bonded wafer at the site of said ion-implanted layer as an interface.

Based at least on the above, and on the reasons set forth in the response to the rejection under 35 U.S.C. 102(b), the KIKUCHI and SAKAGUCHI documents, either alone or in combination, fail to anticipate or fairly suggest the disclosed and claimed subject matter. Accordingly, Applicants respectfully request withdrawal of the rejections under 35 U.S.C. § 103(a).

The Office Action also rejects claims 9 and 14 under 35 U.S.C. § 103(a) as allegedly unpatentable over KIKUCHI in view of Samata et al. (U.S. Patent No. 6,008,110; hereinafter

SAMATA). In particular, the Office Action asserts that while KIKUCHI fails to disclose a supporting wafer subjected to annealing at 1100°C or higher in a reducing gas atmosphere containing hydrogen gas before the step of bonding, SAMATA allegedly teaches a method of SOI manufacturing in which the supporting wafer is subjected to annealing at 1100°C or higher in a reducing gas atmosphere containing hydrogen gas before the step of bonding.

In response, Applicants submit that the disclosed and claimed invention is not unpatentable over KIKUCHI and/or SAMATA, either alone or in combination. In particular, Applicants submit that neither KIKUCHI nor SAMATA disclose or fairly suggest "[a] manufacturing method of an SOI wafer, comprising

bonding a wafer for active layer with a supporting wafer via an insulating film interposed therebetween to thereby form a bonded wafer; and then

reducing a film thickness in a part of said active layer wafer of said bonded wafer to thereby form an SOI layer for manufacturing said SOI wafer, wherein said supporting wafer contains boron by an amount of $9x10^{18}$ atoms/cm^3 or more; and

forming a rear surface insulating film on a surface opposite to the bonding surface of the supporting wafer prior to said bonding." Neither do the cited documents disclose or fairly suggest such a method in which said supporting wafer is subjected to annealing at 1100°C or higher in a reducing gas atmosphere containing hydrogen gas before said step of bonding.

Based at least on the above, and on the reasons set forth in the response to the rejection under 35 U.S.C. 102(b), the KIKUCHI and SAMATA documents, either alone or in combination, fail to anticipate or fairly suggest the disclosed and claimed subject matter. Accordingly, Applicants respectfully request withdrawal of the rejections under 35 U.S.C. § 103(a).

The Office Action also rejects claims 11-13 and 15-17 under 35 U.S.C. § 103(a) as allegedly unpatentable over KIKUCHI in view of SAKAGUCHI as applied to claim 2, and further in view of SAMATA. In particular, the Examiner asserts that the limitations of the rejected claims have been described earlier in the rejection of claims 9 and 14.

In response Applicants submit that the disclosed and claimed invention is not unpatentable over KIKUCHI and/or SAKAGUCHI and/or SAMATA, either alone or in combination. As explained above, Applicants submit that neither KIKUCHI, nor SAKAGUCHI, nor SAMATA disclose or fairly suggest "[a] manufacturing method of an SOI wafer, comprising

bonding a wafer for active layer with a supporting wafer via an insulating film interposed therebetween to thereby form a bonded wafer; and then

reducing a film thickness in a part of said active layer wafer of said bonded wafer to thereby form an SOI layer for manufacturing said SOI wafer, wherein said supporting wafer contains boron by an amount of $9x10^{18}$ atoms/cm^3 or more; and

forming a rear surface insulating film on a surface opposite to the bonding surface of the supporting wafer prior to said bonding." Neither do the cited documents disclose or fairly suggest such a method further comprising:

ion-implanting of hydrogen gas or a noble gas element to said active layer wafer to thereby form an ion-implanted layer in said active layer wafer;

subsequently bonding said active layer wafer and said supporting wafer together to thereby form a bonded wafer; and then

heat treating said bonded wafer to thereby induce cleavage in said bonded wafer at the site of said ion-implanted layer as an interface, and in which said supporting wafer is subjected

to annealing at 1100°C or higher in a reducing gas atmosphere containing hydrogen gas before said step of bonding.

Based at least on the above, and on the reasons set forth in the response to the rejection under 35 U.S.C. 102(b), the KIKUCHI, SAKAGUCHI, and SAMATA documents, either alone or in combination, fail to anticipate or fairly suggest the disclosed and claimed subject matter. Accordingly, Applicants respectfully request withdrawal of the rejections under 35 U.S.C. § 103(a).

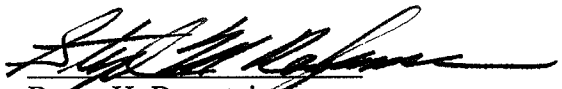
CONCLUSION

In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejections of record, and allow all the pending claims.

No additional fee is believed due at this time. If, however, any additional fee is necessary to ensure consideration of the submitted materials, the Patent and Trademark Office is hereby authorized to charge the same to Deposit Account No. 19-0089.

Any comments or questions concerning this application can be directed to the undersigned at the telephone number given below.

Respectfully submitted,
Akihiko ENDO et al.



Bruce H. Bernstein
Reg. No. 29,027

Stephen M. Roylance
Reg. No. 31,296

July 24, 2008
GREENBLUM & BERNSTEIN, P.L.C.
1950 Roland Clarke Place
Reston, VA 20191
(703) 716-1191